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A Relational Account of the Causes of Spatial Firm Mobility

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A Relational Account of the Causes of Spatial Firm Mobility

Abstract

The existing literature on the spatial mobility of firms neglects inter-organizational relations (IORs). This is striking since there is a strong theoretical argument that firms with a high level of embeddedness are unlikely to relocate. Therefore, the following research question is posed: *"To what extent is the level of embeddedness of firms in (localized) innovative inter-organizational relationships of influence on their propensity to relocate?"*

Based on data from the automation service sector, an ordered logit model is estimated. The results show that embeddedness is an important determinant of spatial firm mobility. More specifically, there is a strong spatial lock-in effect of having a high degree centrality.

Key words: Firm relocation, spatial mobility, spatial lock-in, spatial inertia, inter-organizational relationships, embeddedness.

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Ties that Spatially Bind?

A Relational Account of the Causes of Spatial Firm Mobility

1. Introduction

The causes of the spatial mobility of firms have been studied in numerous papers. However, the vast majority of these papers focus primarily on geographical characteristics. The fact that most firms do not operate in isolation but are often engaged in inter-organizational relationships (IORs) and networks that influence their actions is largely neglected. This is especially striking since it is widely accepted in the scientific literature that exchanges within networks have an ongoing structure that both enables and constrains the behavior of its members (Granovetter, 1985). A possible constraining effect of being involved in IORs and networks is spatial lock-in, also known as spatial inertia, of a firm (Romo & Schwartz, 1995), which implies that firms are unable to relocate even though they might like to do so from a cost perspective.

Following Granovetter (1985), the extent to which being involved in IORs and networks influences the spatial mobility of firms can be argued to be dependent on both the overall structure of the inter-organizational network in which the firm operates as well as on the characteristics of the dyadic relations of a firm. However, only weak empirical evidence is available for the proposed relationships between the level of a firm's participation in (localized) IORs and its propensity to relocate. The main goal of this research is to provide empirical insights into this relationship. Based on the above, the following research question has been formulated: *"To what extent is the level of embeddedness of a firm in (localized) innovative inter-organizational relationships of influence on its propensity to relocate?"*

The contributions of this paper to the literature are threefold. First, it adds a relational perspective to the literature with regard to firm relocation, which so far has largely neglected

that fact that firms do not operate in isolation, but often maintain IORs which influence their behavior. Combining this relational perspective with the existing geographical perspective seems fruitful since IORs and networks are getting more and more abundant, are increasing in importance, and have a large influence on the behavior of firms (Borgatti & Foster, 2003). Second, it empirically explores a possible constraining effect of IORs and networks. Even though the possible constraining effects of networks are largely acknowledged, most empirical research in inter-organizational settings has focused on the enabling effects of network relations and network structures only (Kim *et al.*, 2006; Knoben *et al.*, 2006). Finally, this research will empirically research the claim that several characteristics of a dyadic tie, and high levels of organizational proximity in particular, can negate the need for geographical proximity in IORs. This claim is often made in the literature (e.g. Torre & Rallet, 2005), but has received little empirical attention so far. Therefore, this paper might provide an (onset to an) answer to an ongoing debate in the literature.

The remainder of this paper starts with a discussion of the traditional drivers of a firm's relocation propensity (Section Two). Subsequently, the concept of spatial lock-in will be discussed (Section Three). In Section Four, the dataset that has been used for this analysis will be presented and the methodology that is used to analyze the data will be discussed. In Section Five, the main outcomes of the analyses will be presented and discussed. Finally (Section Six), the implications of the findings will be discussed and put into a broader perspective.

2. Traditional drivers of firm relocation

The causes of firm relocation have been studied extensively from a geographical point of view. Four groups of factors, which incorporate the most commonly found determinants of

firm relocation in the literature (c.f. Brouwer *et al.*, 2004; Van Dijk & Pellenbarg, 2000; Holguin-Veras *et al.*, 2005; Holl, 2004; Van Steen, 1998), are included in this research. These groups of factors are: firm internal characteristics, characteristics of the building, characteristics of the site, and characteristics of the region.

2.1 Firm internal characteristics

The internal characteristics of a firm that are found to be of influence on its propensity to relocate are the growth rate of a firm, the geographical scale of its operations, and its previous relocation behavior. The impact of these characteristics on a firm's propensity to relocate will be discussed subsequently.

The growth rate of a firm is of importance for the propensity of firms to relocate since it gives an indication of the speed with which the firm is expanding. An expanding firm is likely to need more room, for example to accommodate its employees, and therefore is more likely to relocate (Schmenner, 1980; Van Wissen, 2002). Moreover, fast growing firms are more likely to access new costumers/markets in order to realize their growth and might therefore relocate to obtain a more strategic position (Stam, 2003). On the other hand, a firm with a large negative growth rate is likely to relocate as well, since its current location will become too large and too expensive.

H1: There is a U-shaped relationship between the growth rate of a firm and its propensity to relocate.

The geographical scale of operations refers to the spatial scale within which the firm buys and sells it products/services. Previous research has shown that firms in industries with a tendency to buy and sell many products/services in their home region are less likely to move compared

to firms that sell products throughout the country or even the world (Schmenner, 1980). The main reason is that these firms are dependent on the local market (and sometimes vice versa (Kilkenny *et al.*, 1999)) and, therefore, have much to lose when they relocate.

H2: The higher the level of localization of the scale of operations of a firm, the lower its propensity to relocate.

Research has shown that firms that have moved recently (i.e. during the last two years) are unlikely to move, whereas firms that moved between 5 and 10 years ago show a higher propensity to move (again) (Van Steen, 1998). The underlying train of thought is that firms, on average, outgrow their new location in approximately 5 to 10 years, which gives cause for another relocation (Van Dijk & Pellenbarg, 2000). This results in the following hypothesis.

H3: Firms that have relocated in the last two years show a lower propensity to relocate, compared to firms that did not relocate during this period.

2.2 Characteristics of a firm's building

The characteristics of a firm's building that are found to be of influence on its propensity to relocate are the available room for expansion and the question whether or not a firm owns the building in which it is located.

The available room for expansion is considered to be one of the main drivers of firm relocation. Of all firms that relocate, 77% indicates that the main driver was the lack of room for expansion (Van Steen, 1998: 42).

H4: Firms with insufficient room for expansion in their current building will face a higher propensity to relocate compared to firms with enough room for expansion.

Ownership of the building is of importance for a firm's propensity to move, since the costs and trouble of getting rid of the present building are much higher compared to firms that rent their building. Furthermore, the reverse might also be true, because firms will only decide to buy a building if they expect to stay at that location for a long time.

H5: Firms that own their buildings will face a lower propensity to relocate compared to firms that rent their building.

2.3 Characteristics of the site at which a firm is located

Two characteristics of a site at which a firm is located are generally found to be of importance on a firm's propensity to relocate, namely the distance to infrastructural facilities and the type of area in which a firm is located (Holl, 2004).

The importance of the accessibility of the building seems logical, especially in countries plagued by congestion such as The Netherlands. It is generally found that firms that are located nearby main infrastructural facilities will have a better accessibility and, therefore, will be less likely to move (Holl, 2004).

H6: The longer the travel-time between a firm and main infrastructural facilities, the higher its propensity to relocate.

The importance of the type of area a firm is located in is tied to the fact that certain types of areas face more congestion and face more problems with regard to accessibility regardless of

the presence of infrastructural facilities (Van Dijk & Pellenbarg, 2000). Firms located in a city center can face large congestion problems and might decide to relocate to a location with better accessibility at the edge of the city (Medda *et al.*, 1999). Firms located in residential areas are very often start-ups, which also face a high propensity to relocate. On the other hand, firms located in rural areas (Kilkenny *et al.*, 1999) or at the borders of cities (Van Dijk & Pellenbarg, 2000) are likely to experience lower propensities to relocate.

H7: Firms located in residential areas or city centers will face a higher propensity to relocate than firms located in rural areas or at city borders.

2.4 Characteristics of the region in which a firm is located

Only a single regional characteristic is often found to be of influence on a firm's propensity to relocate, namely the type of region in which a firm is located. The type of region a firm is located in is of importance due to differences in economic activity and regional labor market situations between regions. As such, firms are more likely to move from the rural regions to the more urbanized regions (Holl, 2004). It should be noted, however, that this relationship is not expected to hold for all sectors (e.g. agriculture), but is primarily applicable to service sectors. This observation has several implications for the choice of the sampling frame which will be discussed in Section Four.

H8: The higher the level of urbanization of the region in which a firm is located, the lower its propensity to relocate.

2.5 Control variable

The size of a firm is sometimes found to be an important predictor of firm relocation as well. In general, relocating firms are smaller than non-relocating firms (Van Dijk & Pellenbarg, 2000). This is mainly due to the fact that the absolute costs of moving for small firms are much lower compared to large firms. However, the size of a firm is also known to affect the number of direct IORs a firm has (Oliver & Ebers, 1998). Therefore, the size of a firm is taken into account is a control variable.

3. Adding relational drivers of firm relocation to the equation

The traditional determinants of firm relocation discussed in the previous section completely neglect the fact that firms are often engaged in IORs and networks. This omission is striking since IORs networks are abundant and, moreover, previous research has shown that the relational variables have a large influence on firm behavior (e.g. Schutjens & Stam, 2003). Therefore, it seems logical to add relational variables to the equation when trying to predict the spatial behavior of firms.

First, following Resource Dependence Theory (Pfeffer & Salancik, 1978), it can be argued that a firm that makes extensive use of resources possessed or controlled by external actors for its innovative processes, will become dependent on these actors. These dependencies, in turn, influence the behavioral options that are viable for firms. By themselves, the relationships in which these dependencies exist are non-spatial. However, since geographical proximity is assumed to facilitate the successful exchange of (especially tacit) knowledge through IORs (Schutjens & Stam, 2003), dependency on other firms can also lead to dependency on a certain geographical location (e.g. Silicon Valley), and thus to spatial lock-in (Romo & Schwartz, 1995).

Second, the concept of transaction specific investments from transaction cost theory (Williamson, 1981) also holds for investments in a location. This specific case of transaction specific investments is called "site specificity" (Dyer, 1996). The investments made in its present location, which can be seen as sunk costs, are, to a certain extent, specific to that location and will be lost once a firm decides to leave that location. This reasoning can be applied to both material investments (e.g. buildings) and to more intangible costs, such as investments in (localized) IORs. As such, firms that have invested heavily in their IORs might face a disincentive to relocate.

Finally, similar arguments can be found in the literature on Territorial Innovation Models (see for an overview: Moulaert & Sekia, 2003). In this body of literature, regions are considered to be entities with a collective pool of knowledge, institutional structure, and social conventions in which a firm is embedded (Malmberg, 1997). Therefore, the development of (the capabilities of) firms will be both region- and path-dependent (Stam, 2003). These developments lead to dependence on localized inputs and production factors, which, in turn, might deter a firm from relocating even if doing so is beneficial from a cost perspective (Romo & Schwartz, 1995).

Even though the above presents arguments for the existence of the relationship between a firm's level of embeddedness and its propensity to relocate, more specific mechanisms are needed in order to formulate concrete hypothesis based on measurable concepts. For this purpose, the theoretical discussion of embeddedness by Granovetter (1985) offers several handholds. Granovetter states that the behavior of actors is influenced by both the overall structure of its network as well as by the characteristics of its dyadic relationships. In order to analyze the effect of the level of embeddedness on a firm's propensity to relocate, both aspects of embeddedness will have to be taken into account.

3.1 Overall network structure

The effect of a firm's overall network structure refers to the fact that firms occupy a certain position in the network(s) in which they participate (e.g. central vs. peripheral). This structural position has been shown to influence a firm's behavioral options (Gnyawali & Madhavan, 2001). In the literature, many different indicators for the network position of a firm can be distinguished. One of the most commonly used indicators of a firm's structural network position is the degree centrality of firm (e.g. Ahuja, 2000). The degree centrality of a firm is simply measured by counting the total number of direct ties that a firm has. Direct ties in this respect refer to two actors that have a direct, dyadic relation in contrast to indirect ties, which refers to actors that are linked only through another actor (e.g. friends of a friend) (Wasserman & Faust, 1994). By focusing on the direct ties of a firm, its ego-network can be constructed. That is, the relations between the focal firm (the ego) and its direct partners (the alters) can be mapped.

The theoretical mechanism underlying the relation between the amount of direct ties that a firm has and its propensity to relocate is based on the need for stability in IORs. Resource exchange, and more specifically knowledge exchange, is facilitated by stable, long term, IORs (Ahuja, 2000). A relocation might threaten this stability, which hampers the functioning of these relationships and, ultimately, the performance of a firm. Therefore, firms are likely to be hesitant to relocate when they are involved in many IORs. The need for stability is strongest in direct relations that are based on knowledge exchange (rather than for example simple buyer-supplier relations), since such relations are characterized by high levels of uncertainty, strong appropriation concerns, and require high levels of trust (Saviotti, 1998). Therefore, the relationship between the number of IORs of a firm and its propensity to relocate can be mainly attributed to these, so called, direct innovative IORs. Based on the above, the following hypothesis has been formulated.

H9: The more direct innovation IORs a firm has, the lower its propensity to relocate.

Another structural characteristic of the ego-network of a firm which might influence its spatial behavior is the extent to which the ego-network is localized. Being dependent on localized partners (i.e. knowledge sources) might lead to spatial inertia because geographical proximity facilitates face-to-face contacts, which facilitate the transfer of tacit knowledge (Schutjens & Stam, 2003). It can be argued that high degrees of localization of a firm's ego-network will lead to a lower propensity to relocate for a firm. Consequently, the following hypothesis has been formulated.

H10: The higher the level of localization of a firm's external knowledge sources the lower its propensity to relocate.

3.2 Interactions in dyadic relationships

Besides the structural characteristics described in the above, several characteristics of interactions that take place in dyadic ties that might influence a firm's propensity to relocate can be found in the literature as well. First, not all IORs are equally important to firms. Therefore, the strength of a firm's direct innovative IORs is likely to influence the relation between the number of direct innovative ties a firm has and the overall level of localization on the one hand, and its propensity to relocate on the other hand.

The relationship proposed in the above is in contrast with the "strength of weak ties" argument posed by Granovetter (1973), and rather builds on the argument of the "strength of strong ties". This argument basically states that strong ties will have the largest effect on an

actor's (in this case a firm's) behavior, since strong ties carry more value to a firm especially in uncertain situations, such as innovative projects (Krackhardt, 1992).

H11: The stronger a firm's innovative IORs, the more negative the relationship between the number of direct innovative IORs and the localization of external knowledge sources and its propensity to relocate.

Second, the necessity of geographical stability for successful inter-organizational knowledge exchange is not undisputed in the literature. Several authors claim that high levels of organizational proximity may facilitate knowledge exchanges over large and changing geographical distances (see for an overview: Torre & Rallet, 2005). Organizational proximity can be defined as *"the set of routines – explicit or implicit – which allows coordination without having to define beforehand how to do so. The set of routines incorporates organizational structure, organizational culture, performance measurements systems, language and so on"* (Rallet & Torre, 1999). High levels of organizational proximity are argued to generate the capacity to transfer tacit knowledge and other non-standardized resources despite large geographical distances (Burmeister & Colletis-Wahl, 1997).

If this claim holds, participation in direct innovative IORs will not necessarily have an effect on the spatial behavior of firms, since a firm can maintain its IORs just as easily from a different geographical location if the level of organizational proximity is high enough (Morgan, 2004).

H12: The higher the level of organizational proximity between a firm and its innovative IORs, the less negative the relationship between the number of innovative IORs and the localization of external knowledge sources and its propensity to relocate.

Based on the studies above, the following conceptual framework is constructed (Figure 1). In the next sections, the data collection procedure and the operationalization of these theoretical concepts will be discussed.

Insert Figure 1 here

4. Data collection, measurement, and methodology

In order to collect information with regard to the concepts discussed in the above, a questionnaire was mailed to all firms in the automation services sector in The Netherlands with more than 5 full-time employees. A single sector design has been chosen since there are large differences in relocation propensity between sectors. The automation service sector was chosen since it is a fairly dynamic sector in which firm relocations are relatively common (compared to for example manufacturing or wholesale) and it is a sector in which IORs are relatively common as well. Furthermore, the automation services sector is a relatively "footloose" sector, due to the high level of ICT-usage in this sector (Hoogstra & van Dijk, 2004). If a spatial lock-in effect of embeddedness could be found in such a sector, this would prove a strong test of the hypothesized effects.

A list of all relevant firms and their addresses were obtained from the Dutch Chamber of Commerce (CoC). After purging the list for empty holdings, bankruptcies, firms with several subsidiaries with the same address, and duplicates, 2.553 firms remained. A questionnaire was sent to all of these firms by mail. Unfortunately, due to the limitations of the database of the CoC, no reliable names of contact person were available. Therefore, the questionnaires were sent to the managing director(s) of all firms.

Ultimately, 203 firms returned a useable questionnaire (a response rate of 8%). Even though this seems like a low response rate, comparable response rates were obtained in similar micro level studies. Oerlemans and Meeus (2005), for example, obtained a response rate of 8%, whereas Rooks *et al.* (2005) achieve a response rate of 8.4%. Both studies used a similar research approach and were conducted in the same field of science. Additionally, from several meta-analyses of response rates (e.g. Baruch, 1999; Cook *et al.*, 2000; Klassen & Jacobs, 2001) it may be concluded that, besides the general downward trend in response rates caused by "saturation" of respondents and lack of time, several other explanations can be given for the relatively low response rates. Most importantly, Baruch (1999) finds that surveys mailed to individuals (and about individual characteristics) have a much higher response rate than surveys mailed to organizational representatives. Klassen and Jacobs (2001) find that SMEs, of which the sector sampled in this research is mainly composed, generally respond less to surveys compared to their larger counterparts. When taking all of these aspects into account the response rate of 8% is not unexceptional.

Nevertheless, the fact that a large group of firms did not respond raises the question whether or not the data might suffer from a sample bias. Therefore, a non-response analysis was performed. A group of 179 non-respondents were approached by telephone and asked to give answers to several key-questions from the questionnaire. These key questions included the relocation propensity, the size of the firm and the presence of innovative IORs. These questions were asked since they include the dependent variable and the main (hypothesized) independent variable. Moreover, firm size was included since it is a variable that is likely to contain bias. Of these 179 firms, 130 were willing to cooperate (response rate of 73%). When asked about the reason for their non-response, the vast majority of the firms (61%) indicated that they had never received the questionnaire. This high percentage can be explained by the fact that the CoC database did not contain reliable information about contact persons. Most

other respondents indicated that they had no time to answer the questionnaire (32%). Other answers given included a principal decision never to cooperate with surveys (5%) or the fact that the survey contained too many confidential questions (2%). The data obtained from these non-respondents allows for a detailed comparison of the respondents and the non-respondents and provide valuable information with regard to the representativeness of the data. A comparison of the data from the non-respondents and the respondents can be found in Table 1.

Insert Table 1 here

From Table 1 can be derived that there are no significant differences between the respondents and the non-respondents with regard to the variables under scrutiny. The fact that firms with a very low propensity to relocate are a little bit underrepresented as respondents might be explained by the fact that firms with this characteristic might be less interested in the topic and, therefore, are less inclined to return the questionnaire. However, this difference is not statistically significant.

For several other variables, the respondents could be compared to the whole population, since these variables could be extracted from the CoC database. A comparison between the respondents and the entire population with regard to these variables can be found in Table 2.

Insert Table 2 here

From Table 2 it can be derived that, for the variables under scrutiny, there is no difference between the respondents and the sample as a whole. Both the spatial distribution and the past relocation behavior of the respondents seems to be representative for the population as a

whole. On the basis of Table 1 and 2, it can be concluded that there do not seem to be any structural differences between the respondents and the non-respondents. Therefore, there is no indication of sample bias in the data.

4.1 Measurement

The dependent variable in the model is the propensity of a firm to relocate. The relocation propensity of a firm has been measured by a scale developed by Van Steen (1998), which is also used by Van Dijk and Pellenbarg (2000) and Brouwer *et al.* (2004). Van Steen (1998) developed an 8 point scale (see Table 1 for a precise description of this scale) which reflects how likely a firm is to relocate within the next two years.

The relational variables that deal with the overall structure of a firm's ego network are the number of direct innovative IORs and the level of localization of a firm's external knowledge sources. In order to obtain information with regard to these variables, respondents were first asked to report the total number of innovative IORs they had. Furthermore, respondents were asked to report on the total number of organizations the firm used as external knowledge sources, and the number of these organizations that were located within 20 kilometers of the respondent's firm. From these answers, the percentage of a firm's external knowledge sources that can be considered localized was computed.

In order to obtain information about the characteristics of the dyadic relations of a firm, respondents were asked to answer several questions about the main innovative IOR of a firm. This approach has been chosen since the survey has insufficient space to question all innovative IORs of a firm in detail. Moreover, the problem of non-response becomes exceedingly large when firms are asked about characteristics of more than one IOR. The approach of focusing on the main innovative IOR of a firm has been adopted from the Community Innovation Survey (CIS).

The strength of the main IOR of a firm is measured by using the dimensions of tie strength as discussed by Gilsing and Nooteboom (2005), which are basically inter-organizational translations of the dimensions of inter-personal tie strength proposed by Granovetter (1985). The scope of the tie, the level of formal control, the specific investments in mutual understanding, the duration of the tie, and the frequency of (face-to-face) interaction are used as measures of tie strength.[1] The first four items are measured by asking a firm's response (on a 5-point likert scale) to statements about these dimensions of tie strength. The last two items are measured by asking firms about the duration of the relation with their focal IOR and the frequency of their contacts with this partner.

These items were analyzed with a factor analysis (see Table 3). From this factor analysis, it becomes clear that the concept of tie strength consists of 2 separate dimensions, namely intensity and the form of a tie. The first factor contains items that describe the intensity of the interaction between two actors, whereas the second factor contains items that describe the functional form in which the interactions take place. Both dimensions are used separately in the final analysis.

Insert Table 3 here

The level of organizational proximity between the focal firm and its main direct IOR is measured by asking firms (on a 5 point likert scale) to react on statements with regard to whether or not the main IOR has the same other partners (relation dimension), the same organizational norms and values (institutional and cultural dimension), and the same organizational structure (structural dimension). These dimensions correspond to the most common and complete definition of organizational proximity (see: Knoben & Oerlemans, 2006; Torre & Rallet, 2005).

These dimensions were analyzed with a factor analysis (see Table 4). From this factor analysis, it becomes clear that the concept of organizational proximity is indeed captured by these three dimensions (i.e. they form a single factor).

Insert Table 4 here

The growth rate of a firm is measured by looking at the change in the number of employees (in FTE's) over the last two years.

The scale of operations is determined by asking the respondent what share of its total input and output is tied to its home region, which is determined as a circle around the firm with a 20km radius. This is in line with measurements used in earlier studies (Oerlemans *et al.*, 2001).

The previous relocation behavior of the firm is measured by asking respondents to map the total spatial history of the firm. Data is collected on the year of the relocation(s), the municipality of origin, and the municipality of destination (similar to: Van Dijk & Pellenbarg, 2000).

The available room for expansion is measured by asking whether or not there is sufficient room for expansion in the current building of the firm, which is identical to the approach used by Van Steen (1998).

Ownership of the building is determined by asking whether or not the firm is the owner of the building it is currently established in (identical to: Van Dijk & Pellenbarg, 2000).

The accessibility of the building is measured by asking the respondent about the average travel time between the firm and the nearest highway and the nearest train station. This approach is slightly more sophisticated than the distance measures that are normally used (e.g.

Van Dijk & Pellenbarg, 2000), since it uses travel time, rather than straight line distance measures. As such, this measure represents the concept of accessibility better.

The type of area a firm is located in will be determined on the basis of the 6 digit postal code of the responding firm. On the basis of its postal code, it will be determined whether a firm is located in a rural area, a city centre, at the edge of a city, or in a residential area. This approach is identical to the one used by van Dijk and Pellenbarg (2000) and corresponds to the categorization that is used in the theoretical literature concerning firm relocation as well.

The type of region a firm is determined by using the level of urbanization of the municipality the firm is located in. These data has been obtained from the Dutch Central Bureau of Statistics. Their scale of urbanization distinguishes between 5 levels of urbanization, ranging from (1) heavily urbanized to (5) rural.

A short overview of the variables described in the above and their definition can be found in Table 5.

Insert Table 5 here

4.2 Methodology

The structure of the measurement of the dependent variable has some implications for the methodology that can be used to analyze these data. The dependent variable consists of eight categories. Even though these categories represent chances that a firm will relocate in the coming two years, the unit distance between the different categories does not carry any significance. For this type of data, ordered logit models are the most suitable methodology (Norušis, 2004). This methodology has been used in earlier studies with an identical dependent variable as well (e.g. Brouwer *et al.*, 2004; Van Dijk & Pellenbarg, 2000).

The ordered logit model is based on the following specification (Verbeek, 2004: 203):

$$y_i^* = \beta x_i^{'} + \varepsilon_i$$

Where x_i is a set of explanatory variables and ε_i is the disturbance term. Finally, y_i^* is the unobserved probability that a firm will relocate in the coming two years. What is observed can be written as:

$$\begin{aligned} &y_i = 0 \; if \; y_i^* \le \mu_0, \\ &y_i = 1 \; if \; \mu_0 < y_i^* \le \mu_1, \\ &y_i = 2 \; if \; \mu_1 < y_i^* \le \mu_2, \\ &..... \\ &y_i = 7 \; if \; y_i^* \le \mu_6. \end{aligned}$$

Where the μ's are unknown parameters to be estimated with the β's. Each respondent has its own y_i^*, which is determined by the measured x_i's and the unobserved factors ε_i. Each respondent chooses the category of y that represents its y_i^* most closely.

When fitting an ordinal regression model, it is assumed that the relationships between the independent variables and the logits are the same for all logits. This assumption can be tested with the so called "test of parallel lines". Ordinal regression is an appropriate methodology when the value of this test is above 0.10 (Norušis, 2004: 74).

Since the goal of this research is to assess the added value of relational variables to the relocation literature, the obtained models, both with and without relational variables, have to be compared in terms of model fit. In order to compare models, the Akaike's Information Criterion (AIC) has been calculated for each model. The AIC provides information about the explanatory power of a model relative to the number of parameters that has been used (Sakamoto, 1991). The lower the AIC, the better the fit of the model.

5. Empirical results

Two different samples have been used for the analyses. One for all responding firms and one for firms with one or more IORs. This sub-sample has been made to be able to include the moderating effects of the relational variables proposed in the theoretical section of this paper. Since firms without any direct innovative IORs do not score on these variables at all, they had to be excluded from this analysis. Descriptive statistics and correlation matrices for both samples can be found in Table 6 and 7. From these Tables, it can be derived that both samples are very similar and that the level of collinearity between the variables is very low. Therefore, no problems of multicollinearity occurred.

Insert Table 6 and 7 here

In total, six different models have been estimated, two for all responding firms (model 1 and 2) and four for only the firms with at least one direct innovative IOR (model 3 through 6). Model 1 serves as a baseline model. In this model, only the traditional drivers of firm relocation, as used in many geographical studies, have been incorporated and all respondents have been included. Model 2 expands model 1 by incorporating the structural characteristics of a firm's ego network. Model 3 is another baseline model, but this time it has been estimated for a sub-sample of firms with at least one direct innovative IOR only. Model 4 is equivalent to model 2, but specified to the subset of firms with at least one direct innovative IOR. Finally, model 5 and 6 incorporate the moderating effects of the relational variables proposed in hypothesis 11 and 12. The results of the estimation of these models are presented in Table 8.

Insert Table 8 here

From Table 8, it becomes clear that ordinal regression is indeed the appropriate technique to analyze these data, as the value of the test of parallel lines is sufficiently high for all models (Norušis, 2004: 74). Moreover, all models fit the data well, as can be derived from the significance levels and the differences in log-likelihood between the restricted model and the estimated model, which is also reflected in the relatively high levels of the pseudo-R^2.

As can be derived from the AICs presented in Table 8, model 2 is the best fitting model for the entire sample, whereas model 5 is the best fitting model for the sub sample of firms IORs. This indicates that the addition of relational variables significantly increases the explanatory power of the models compared to the models including only the traditional drivers of firm relocation.

Next, the estimation results for each of the categories of variables distinguished earlier will be discussed.

5.1 Firm internal characteristics

With regard to the "traditional" drivers of relocation, some interesting results are obtained. First, the relationship between the growth rate of a firm and its propensity to relocate is highly significant, but seems to follow an inverse U-shape, rather than the hypothesized U-shape. The implication of this finding is that firms that performed either very poorly (i.e. are shrinking) or extremely well (i.e. quadrupled in size within 2 years) are very unlikely to relocate. The former might be explained by the fact that poorly performing firms lack the financial resources to relocate, but it is harder to interpret the latter finding. It might be the case that firms that grow at such enormous rates employ other strategies to accommodate their growth (such as mergers, takeover, and branching) (Brouwer *et al.*, 2004; Hoogstra & van Dijk, 2004). Another possible explanation lies in the fact that the dataset contains a limited number of firms that shrank (i.e. 13). The number of observations on the left hand side of the

range is rather low, which might account for the fact that no U-shaped pattern is found. Based on the above, hypothesis one is rejected.

Second, producing for a highly localized market seems to reduce a firm's likelihood to relocate, whereas drawing mainly from localized inputs does not. These findings substantiate the importance of proximity to markets for the location preferences of firms and confirm the predictions made in hypothesis two.

Third, previous relocation within the last two years indeed seems to lower the likelihood of (another) relocation. Therefore, hypothesis three is confirmed.

Finally, the size of a firm is significant only in model 1. The fact that it becomes insignificant in model 2 can be explained by the fact that, as expected, there is a, but relatively small, correlation between the number of IORs of a firm and its size (see Table 6). As a result, the effect of firm size drops from just significant to non-significant. Moreover, in model 3 size is insignificant due to the fact that for the sub-sample of firms with one or more IORs the size variable has a smaller range compared to the whole sample (see Table 5).

5.2 Characteristics of a firm's building

Previous research found that the characteristics of the building in which a firm is housed are important predictors of a firm's propensity to relocate. The findings presented in Table 8 partly substantiate these findings. Firms that experience a lack of expansion room face a much higher propensity to relocate compared to firms with enough room to expand. Moreover, firms that own the building in which they are housed report a lower propensity to relocate. However, this last effect is mainly significant for the sample as a whole and not for firms with IORs. This indicates that site ownership is a weaker keep factor for firms with IORs compared to firms in general. As such, hypothesis four is confirmed, whereas hypothesis five is only partly confirmed.

5.3 Characteristics of the site at which a firm is located

The characteristics of the site seem to play a peripheral role as determinants of a firm's propensity to relocate. Only the accessibility of a firm's location by train seems to be of importance, and only for the sub-sample of firms with one or more direct innovative IORs. This might indicate that for firms with IORs, being located on an easily accessible location is more important than for other firms. The underlying explanation could be that these firms require frequent face-to-face contacts with their partners to collaborate efficiently, which emphasizes the importance of accessibility.

These weak effects of the accessibility of a site might be explained by the characteristics of the country in which this data was gathered. The Netherlands is a rather small country with a very dense road and railway network. Therefore, the vast majority of firms are located very close to these infrastructural facilities. Earlier research into the relationship between accessibility and the relocation propensity of firms in The Netherlands indeed found (almost) no effects of the level of accessibility of a site (Van Dijk & Pellenbarg, 2000), whereas for other countries in which this relationship has been tested, significant effects are found (e.g. for in Portugal see Holl, 2004). Therefore, hypothesis seven is rejected, whereas hypothesis six is only partly (and weakly) confirmed.

5.4 Characteristics of the region in which a firm is located

The characteristics of the region in which a firm is located do seem to be of importance for a firm's propensity to relocate. With the exception of model 1, the level of urbanization has a significant effect in all models. The fact that it becomes significant in model 2 is likely to be caused by the small correlation between the share of localized external knowledge sources and the level of urbanization of a region in which a firm is located. This correlation seems

logical since the higher the level of urbanization of a region, the more firms are located within it. Therefore, the probability of finding suitable knowledge sources within this region increases, leading to a higher share of localized external knowledge sources.

On the whole, the findings indicate that firms that are located in regions with a higher level of urbanization show, ceteris paribus, significantly higher relocation propensities than firms in more rural areas. The findings are contradictory to hypothesis 8 and indicate that firms in rural areas are less likely to relocate. These findings might be explained by the fact that these firms often serve a more local market and or more intertwined with their market area in general (KILKENNY *et al.* 1999).

The difference between model 1 and 3 indicates that being located in an urbanized region is a push factor for firms with one or more IORs. This might be an indication that these firms are less dependent on being in urbanized areas since they access external resources through other channels (i.e. their IORs).

5.5 Relational variables

With respect to hypothesis 9, strong support is found in the data. In all models in which the variable has been included, a significant negative effect of the amount of direct innovative IORs on a firm's propensity to relocate is found. This indicates that firms with a high degree centrality indeed experience a spatial lock-in effect as a result of their structural network position. Moreover, it is a clear indication that being involved in large amounts of IORs does not only hold benefits for the participating firms, but also constrains their (in this case spatial) behavior.

With regard to the percentage of localized external sources mixed results are obtained. In model 2, 4 and 5, the sign of this variable is, as expected, negative, but statistically insignificant. However, in model 5, this coefficient is significant and carries the expected

negative sign. It may be concluded that, relative to other firms that make use of external knowledge sources, firms that use predominantly localized external knowledge sources experience a somewhat lower propensity to relocate. However, the fact that the effect of the total amount of IORs is much stronger (in terms of significance) than the effect of the localization of external knowledge sources indicates that the effect of a firm's overall ego network structure on its propensity to relocate can be mainly attributed to its degree centrality rather than to the level of localization of its ego network.

When comparing the AIC of the models including the structural characteristics of a firm's ego-network to the models without these characteristics, it becomes clear that the models including these characteristics fit the data better. This indicates that the addition of structural characteristics of a firm's ego-network to a model with traditional drivers of firm relocation enhances the explanatory power of these models.

The characteristics of the main IOR of a firm seem to matter only for localized relations. From the comparison of model 4, 5, and 6 it can be concluded that both high levels of organizational proximity as well as specific functional forms of IORs (i.e. young and highly formalized relations) can negate the spatial lock-in effects of relying heavily on localized external knowledge sources. However, the intensity of a relation does not seem to strengthen the spatial lock-in effect. These findings indicate that organizational proximity can indeed facilitate knowledge transfers over large(r) geographical distances, whereas the need for geographical proximity can be negated by choosing the appropriate functional form for an IOR. Furthermore, when comparing model 5 and 6 to model 4 it becomes evident that the negative coefficient of the total number of direct innovative IORs a firm has is larger when the analysis is corrected for the characteristics of the main IOR of the firm. This finding also indicates that part of the spatial lock-in effects of a firm's overall network structure can be

negated by dyadic characteristics. On the whole, these findings support hypothesis 9 and partly support hypothesis 10, 11, and 12.

When comparing the AIC of the models including relational characteristics to the models without these characteristics, it becomes clear that the models including these characteristics fit the data better. Their explanatory power is better than the model including only the traditional drivers of firm relocation, but also better than the model including only the structural characteristics of a firm's ego-network. This indicates that the addition of relational variables enhances the explanatory power of the models even further than the models including only the structural characteristics of a firm's ego-network and, thereby, provides evidence that both dimensions of a firm's level of embeddedness are relevant for the spatial behavior of firms.

6. Conclusions

The research presented in this paper was set out with the aim to assess the relative contribution of adding relational variables to a field of research that has been dominated by (economic) geographers. Moreover, it tried to shed some light on the possible constraining effects of IORs, which is a largely neglected topic in the literature. Finally, it set out to provide an onset of an empirical answer to the question whether a high levels of organizational proximity is a substitute for geographical proximity in IORs.

With regard to the first point, this research shows that, even when all traditional drivers of firm relocation are included, relational variables are significant additions to the model. This does not indicate that the relational variables are better predictors of a firm's propensity to relocate than the traditional determinants, but it does signal that they provide a valuable addition. Better fitting models that explain larger parts of the observed variance are obtained when both groups of variables are included. The fact that variables based on two different

scientific disciplines jointly explain a large part of the variance of a firm's propensity to relocate is strong support for inter-disciplinary approaches. Searching for more topics in which (economic) geography and organization science can jointly explain the behavior of firms might therefore be a promising endeavor.

With regard to the second point it can be concluded that there seems to be a clear spatial lock-in effect of a firm's structural position in its ego-network. From these findings it can be derived that being part of an ego-network with many direct innovative IORs can indeed constrain the subsequent actions of firms. Being involved in IORs limits the spatial mobility of firms and ties them to their current location, even though relocation might carry significant benefits for the firm. Moreover, the existence of this spatial lock-in effect also makes it likely that the relocation of a firm could serve as a critical event and, therefore, could lead to large changes in the relocation firm's inter-organizational network (Knoben *et al.*, 2006).

However, the results also indicate that the spatial lock-in effect caused by a strong localization of external knowledge sources can be (partly) negated by the functional form of a firm's relationships or by high levels of organizational proximity. These findings point at the importance of "managing" the form of a firm's direct relationships to (partly) negate the constraining effects of being involved in these relations. However, the relationship between the characteristics of ties and their effect on the behavior of firms seems to more intricate than theory proposes, since a large spatial lock-in effect of a firm's network position seems to be present whatever the characteristics of a firm's dyadic ties.

Finally, with regard to the third point, based on the findings presented in this paper it can be concluded that high levels of organizational proximity can indeed act as a substitute for geographical proximity. The spatial lock-in effect of geographical embeddedness can be negated by organizational proximity. However, the spatial lock-in effect of structural embeddedness seems to be unaffected by high levels of organizational proximity. These

findings point at an intricate relationship between different types of embeddedness and the role of different types of proximity. Therefore, the findings with regard to the relation between organizational and geographical proximity presented in this paper should merely be seen as the starting point for future research into this topic.

Endnotes

[1]: Gilsing and Nooteboom (2005) also use the level of trust as a determinant of tie strength. Unfortunately, questions about the level of trust between the firm and its focal IOR did not carry any demarcating value. Therefore, this dimension is left out of this analysis.

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Figure 1. Conceptual framework

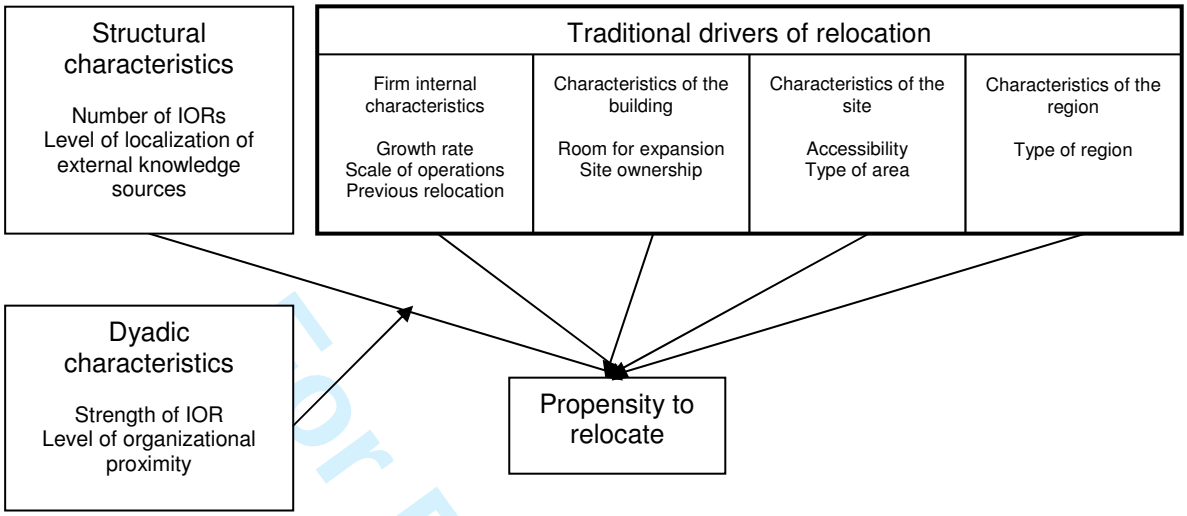

Table 1. Non-response analysis

	Respondents	Non-Respondents	Difference	Significance
Propensity to relocate	Percent	Percent	Percent	p-value
0 (0%)	31	38	7	0,36[a]
1 (1 to 11%)	22	19	-3	
2 (11 to 25%)	13	10	-3	
3 (26 to 50%)	8	7	-1	
4 (51 to 75%)	7	5	-2	
5 (76 to 90%)	6	5	-1	
6 (91 to 99%)	3	3	0	
7 (100%)	12	12	0	
Mean	2,2	2,1	-0,1	
	Respondents	Non-Respondents	Difference	Significance
Size of the firm				
Mean	23,5	33,5	5,9	0,21[b]
Variance	1603,3	7253,2		
Presence of innovative partnerships	Percent	Percent	Percent	
Mean	56	51	-5,00	0,29[c]

a: Mann-Whitney U-test

b: T-test

c: Phi-test

Table 2. Respondents compared to whole population

	Total Sample	Response	Difference	Significance
Spatial distribution (by province)	Percent	Percent	Percent	p-value
Drenthe	1,4	1,0	-0,4	0,18[a]
Flevoland	2,7	2,5	-0,2	
Friesland	1,6	2,0	0,4	
Gelderland	11,6	13,4	1,8	
Groningen	2,3	1,5	-0,8	
Limburg	3,5	5,5	2,0	
Noord-Brabant	14,1	20,9	6,8	
Noord-Holland	20,6	14,4	-6,2	
Overijssel	4,6	5,0	0,4	
Utrecht	13,0	10,9	-2,1	
Zeeland	0,6	0,5	-0,1	
Zuid-Holland	24,1	22,4	-1,7	
Relocation behavior	Percent	Percent	Percent	p-value
% Movers (last 2 years)	23,2	23,9	0,7	0,82[a]
% Movers (last 5 years)	39,3	40,8	1,5	0,66[a]
a: Chi-square test				

Table 3. Factor analysis: Tie strength

	Factor	
Variable	IOR intensity	IOR form
Scope	0,676	
Contact frequency	0,671	
Face to face contacts	0,618	
Level of specific investments	0,576	
Inverse duration		0,733
Level of formal control		0,754
Cronbach's alpha	0,548	0,457
KMO measure	0,639	
Test of Sphericity	54,801	
Significance	0,000	
% of variance explained	52,099	

Table 4. Factor analysis: Organizational proximity

	Factor
Variable	Organizational Proximity
Cultural proximity	0,859
Structural proximity	0,848
Relational proximity	0,453

Cronbach's alpha	0,558

KMO measure	0,541
Test of Sphericity	47,075
Significance	0
% of variance explained	55,383

Table 5. Variables and definitions

Variable	Definition
Propensity to relocate	Likelihood that a firm will relocate within the next 2 years
Growth rate	Growth in employees (in FTE's) of a firm over the last two years
Growth rate squared	Squared growth in employees (in FTE's) of a firm over the last two years
Localization of operations (inputs)	Share of inputs that is drawn from within a radius of 20 km around the firm
Localization of operations (outputs)	Share of turnover that is generated within a radius of 20 km around the firm
Previous relocation (past 2 years)	Dummy variable coded "1" if the firm has relocated with the last two years and "0" otherwise
Firm size (ln)	Natural logarithm of the amount of employees (in FTE's) that work in a firm
Lack of room for expansion	Dummy variable coded "1" if the firm has insufficient room for expansion for the next two years and "0" otherwise
Site ownership	Dummy variable coded "1" if the firm owns the building in which it is presently located and "0" otherwise
Travel time to nearest highway	Travel time in minutes to the nearest highway ramp (by car)
Travel time to nearest transport hub	Travel time in minutes to the nearest public transport hub (by car)
Type of area	Type of area the firm is located in, coded "1" if the firm is located in a residential area or city center and "0" otherwise
Level of urbanization	Level of urbanization of the municipality the firm is located in
Total # of IORs	Total number of direct innovative inter-organizational relations maintained by a firm (i.e. its degree centrality)
% of localized external sources	Share of total external knowledge sources employed by the firm that is located with a 20 km radius around the firm
# of IORs * organizational proximity	The degree centrality of a firm times the level of organizational proximity with its main partner
# of IORs * tie strength (intensity)	The degree centrality of a firm times the tie strength with its main partner
# of IORs * tie strength (form)	The degree centrality of a firm times the tie form with its main partner
% of localized external sources * organizational proximity	The localization of a firm's external knowledge sources times the level of organizational proximity with its main partner
% of localized external sources * tie strength (intensity)	The localization of a firm's external knowledge sources times the tie strength with its main partner
% of localized external sources * tie strength (form)	The localization of a firm's external knowledge sources times the tie form with its main partner

Table 6. Descriptive statistics

	All respondents				Respondents with 1 or more IORs			
Variable	Mean	Minimum	Maximum	Std. Deviation	Mean	Minimum	Maximum	Std. Deviation
Propensity to relocate	2,22	0	7	2,36	2,28	0	7	2,40
Growth rate	19%	-45%	500%	56%	25%	-45%	500%	71%
Growth rate squared	3495%	0%	250000%	25030%	5666%	0%	250000%	33185%
Localization of operations (inputs)	1,68	0	5	1,25	1,67	0	5	1,24
Localization of operations (outputs)	1,75	0	5	1,18	1,67	0	5	1,16
Previous relocation (past 2 years)	0,24	0	1	0,43	0,29	0	1	0,45
Firm size (ln)	2,55	0,41	5,62	1,00	2,60	0,69	5,42	0,96
Lack of room for expansion	0,29	0	1	0,46	0,31	0	1	0,46
Site ownership	0,15	0	1	0,36	0,13	0	1	0,34
Travel time to nearest highway	7,28	0,5	30	5,68	7,30	1	30	6,04
Travel time to nearest transport hub	12,91	1	45	7,81	12,73	1	45	8,24
Type of area	0,81	0	1	0,39	0,79	0	1	0,41
Level of urbanization	2,53	1	5	1,18	2,44	1	5	1,18
Total # of IORs	1,24	0	10	1,70	2,17	1	10	1,74
% of localized external sources	19%	0	100	26%	17%	0	100	24%
# of IORs * organizational proximity	-	-	-	-	-0,05	-8,15	9,81	2,44
# of IORs * tie strength (intensity)	-	-	-	-	0,41	-6,02	22,44	3,23
# of IORs * tie strength (form)	-	-	-	-	-0,11	-7,49	11,70	2,42
% of localized external sources * organizational proximity	-	-	-	-	0,03	-0,70	1,43	0,25
% of localized external sources * tie strength (intensity)	-	-	-	-	0,03	-1,93	0,78	0,29
% of localized external sources * tie strength (form)	-	-	-	-	-0,01	-1,35	2,05	0,32

Table 7. Correlation matrices

Whole sample

	Variable	1	2	3	4	5	6	7	8	9
1	Growth rate	-								
2	Growth rate squared	0,91***	-							
3	Localization of operations (inputs)	-0,04	-0,06	-						
4	Localization of operations (outputs)	-0,07	-0,07	0,41**	-					
5	Firm size (ln)	-0,03	-0,08	-0,07	-0,18*	-				
6	Travel time to nearest highway	-0,10	-0,07	-0,10	-0,09	-0,18*	-			
7	Travel time to nearest transport hub	0,00	0,01	-0,02	-0,03	-0,03	0,18*	-		
8	Level of urbanization	0,02	0,10	-0,23**	-0,15*	-0,18*	0,10	0,12	-	
9	Total # of IORs	0,06	0,05	-0,04	-0,09	0,22**	-0,02	0,07	-0,07	-
10	% of localized external sources	-0,05	-0,07	0,23**	0,36**	-0,07	-0,02	0,03	-0,15*	-0,02

Firms with one or more IORs only

	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Growth rate	-														
2	Growth rate squared	0,94***	-													
3	Localization of operations (inputs)	-0,05	-0,08	-												
4	Localization of operations (outputs)	-0,10	-0,08	0,36**	-											
5	Firm size (ln)	-0,12	-0,13	-0,12	-0,15	-										
6	Travel time to nearest highway	-0,12	-0,09	-0,10	-0,04	-0,16	-									
7	Travel time to nearest transport hub	0,02	0,01	-0,07	-0,01	0,08	0,19*	-								
8	Level of urbanization	0,09	0,15	-0,22*	-0,10	-0,14	0,08	0,08	-							
9	Total # of IORs	-0,03	-0,02	-0,07	-0,08	0,33**	-0,04	0,14	-0,03	-						
10	% of localized external sources	-0,05	-0,09	0,19*	0,34**	-0,09	0,09	0,02	-0,23*	0,05	-					
11	# of IORs * organizational proximity	0,06	0,05	0,16	0,16	0,16	0,02	-0,13	-0,06	-0,09	0,12	-				
12	# of IORs * tie strength (intensity)	-0,06	-0,08	-0,06	0,05	0,19*	0,03	0,03	-0,03	0,45**	0,11	-0,01	-			
13	# of IORs * tie strength (form)	0,13	0,12	-0,01	0,04	-0,19*	0,03	0,11	0,02	0,02	-0,11	-0,33**	0,01	-		
14	% of localized external sources * organizational proximity	-0,04	-0,03	0,03	0,10	0,05	0,02	-0,07	-0,03	0,02	0,09	0,59***	0,12	-0,14	-	
15	% of localized external sources * tie strength (intensity)	0,02	-0,01	0,00	0,29**	0,05	0,00	-0,10	0,02	0,18	0,05	0,16	0,41**	-0,06	0,07	-
16	% of localized external sources * tie strength (form)	0,11	0,03	0,00	0,05	-0,08	0,22*	0,03	0,06	-0,10	-0,13	-0,11	-0,04	0,45**	-0,11	-0,06

*: significant at the 10% level
**: significant at the 5% level
***: significant at the 1% level

Table 8. Ordered logit regression results

	All respondents			Respondents with one or more IORs only			
	Model 1	**Model 2**		**Model 3**	**Model 4**	**Model 5**	**Model 6**
Firm internal characteristics							
Growth rate	**1,700*** **	**1,748*** **		**1,716** **	**1,895** **	**2,261** **	**1,452***
Growth rate squared	**-0,398*** **	**-0,404*** **		**-0,401** **	**-0,439** **	**-0,509*** **	**-0,360** **
Localization of operations (inputs)	0,046	0,061		-0,009	0,019	0,090	0,042
Localization of operations (output)	**-0,249** **	**-0,216***		**-0,334***	**-0,561*** **	**-0,317***	**-0,556*** **
Previous relocation (past 2 years)	**-0,528***	**-0,544***		**-0,751***	**-0,864** **	**-0,805***	**-0,916***
Firm size (ln)	**-0,268***	-0,215		-0,301	-0,006	-0,020	-0,023
Characteristics of the building							
Lack of room for expansion	**2,374*** **	**2,436*** **		**2,249*** **	**2,656*** **	**2,968*** **	**2,740*** **
Site ownership	**-0,605***	**-0,624***		-0,789	-0,728	-0,797	**-1,026***
Characteristics of the site							
Travel time to nearest highway	-0,026	-0,027		-0,024	-0,021	0,027	-0,002
Travel time to nearest public transport hub	0,016	0,022		0,035	**0,047***	**0,045***	**0,056** **
Type of area	-0,171	-0,232		0,033	-0,050	0,193	0,155
Characteristics of the region							
Level of urbanization	-0,174	**-0,213***		**-0,319***	**-0,395** **	**-0,422** **	**-0,415** **
Structural characteristics							
Total # of IORs		**-0,186** **			**-0,561*** **	**-0,640*** **	**-0,641*** **
% of localized external sources		-0,764			-1,363	**-1,704** **	-1,392
Relational characteristics							
Organizational proximity * # of IORs						-0,052	
Tie strength (intensity) * # of IORs						0,023	
Tie strength (form) * # of IORs						-0,013	
Organizational proximity * % localized external sources							**1,364***
Tie strength (intensity) * % localized external sources							0,740
Tie strength (form) * % localized external sources							**1,302** **
Model statistics							
-2 Log likelihood	652,931	646,485		354,838	335,282	312,703	320,634
Restricted Log likelihood	734,135	734,135		409,882	409,882	394,429	394,429
Test of parallel lines	0,555	0,177		1,000	1,000	1,000	1,000
Nagelkerke's Pseudo R-squared	33,5%	36,6%		38,6%	49,6%	54,2%	53,9%
Significance	0,000	0,000		0,000	0,000	0,000	0,000
Akaike's Information Criterion (AIC)	676,931	674,485		378,838	363,282	346,703	354,634
N	203	203		109	109	109	109

*: significant at the 10% level
**: significant at the 5% level
***: significant at the 1% level